(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 December 2004 (16.12.2004)

PCT

(10) International Publication Number
WO 2004/109452 A3

(51) International Patent Classification[7]: G06F 17/50

(21) International Application Number: PCT/US2004/017237

(22) International Filing Date: 1 June 2004 (01.06.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/475,069 30 May 2003 (30.05.2003) US

(63) Related by continuation (CON) or continuation-in-part (CIP) to earlier application:
US 60/475,069 (CIP)
Filed on 30 May 2003 (30.05.2003)

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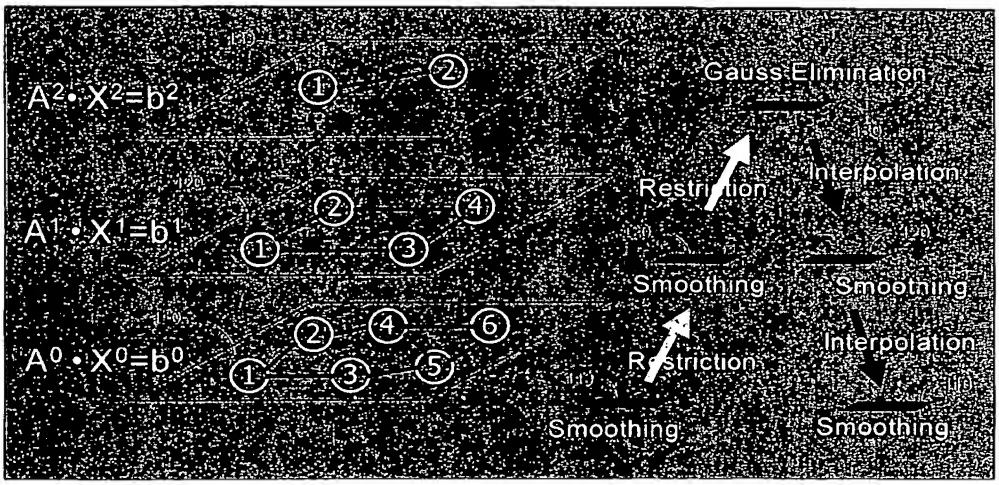
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US (patent), UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

[Continued on next page]

(54) Title: CIRCUIT NETWORK ANALYSIS USING ALGEBRAIC MULTIGRID APPROACH



(57) Abstract: A technique is provided for applying an algebraic multigrid method to analysis of circuit networks with regular and irregular circuit patterns (Figure 1). Smothing is performed at each level in the restriction process from the finest level (110) to the coarsest level (130) and in the interpolation process from the coarsest level (130) to the finest level (110). Adaptive processing may be applied to the grid coarsening and error smoothing operations to increase the processing speed.

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(88) Date of publication of the international search report:
3 March 2005

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US04/17237

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G06F 17/50
US CL : 716/5

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 716/5

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
IEEE, EAST search terms: multigrid, multi, grid, power, coarse, fine, granular, circuit

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Kozhaya, J.N et al. Multigrid-like technique for power grid analysis Computer Aided Design, 2001. ICCAD 2001. IEEE/ACM International Conference on , 4-8 Nov. 2001 Pages 480 - 487	1-11, 14-26
X	Kozhaya, J.N. et al. A multigrid-like technique for power grid analysis Computer-Aided Design of Integrated Circuits and Systems, IEEE Transactions on , Volume: 21 , Issue: 10 , Oct. 2002 Pages:1148 - 1160	1-11, 14-26
A	Nassif, S.R. et al. Multi-grid methods for power grid simulation Circuits and Systems, 2000. Proceedings. ISCAS 2000 Geneva. The 2000 IEEE International Symposium on , Volume: 5 , 28-31 May 2000 Pages:457 - 460 vol.5	1-26

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search
20 October 2004 (20.10.2004)

Date of mailing of the international search report
17 DEC 2004

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Form PCT/ISA/210 (second sheet) (July 1998)

PCT/US04/17237

INTERNATIONAL SEARCH REPORT

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	La Scala, M. et al. A relaxation type multigrid parallel algorithm for power system transient stability analysis Circuits and Systems, 1989., IEEE International Symposium on , 8-11 May 1989 Pages:1954 - 1957 vol.3	1-26
A	La Scala, M. et al. Relaxation/Newton methods for concurrent time step solution of differential-algebraic equations in power system dynamic simulations Circuits and Systems I: Fundamental Theory and Applications, IEEE Transactions on [see also Circuits and Systems I: Regular Papers, IEEE Transactions on] , Volume: 40 , Issue: 5 , May 1993 Pages:317 - 330	1-26
X	Kai Wang et al. Power/ground mesh area optimization using multigrid-based technique [IC design] Design, Automation and Test in Europe Conference and Exhibition, 2003 , 2003 Pages:850 - 855	1-11, 14-26
X, P	Zhengyong Zhu et al. Power network analysis using an adaptive algebraic multigrid approach Design Automation Conference, 2003. Proceedings , 2-6 June 2003 Pages:105 - 108	1-26